



SIGMAA-QL Newsletter

MAA Special Interest Group on Quantitative Literacy

Volume 8, December 2013

Future Opportunities for SIGMAA-QL

Andrew Miller

This January marks the tenth anniversary of the creation of SIGMAA-QL. Such an occasion begs for someone to write a retrospective, a look back at the growth and successes of our SIGMAA. While I do not feel quite equal to that task, it does give me a perfect excuse to muse upon the future of our organization. Our charter defines quantitative literacy as “the ability to adequately use elementary mathematical tools to interpret and manipulate quantitative data and ideas that arise in individuals’ private, civic, and work lives.” It goes on to state that our purpose is to help the mathematics community to

- (a) identify prerequisite mathematical skills for QL,
- (b) find innovative ways of developing and implementing QL curricula,
- (c) assist colleagues in other disciplines to infuse QL experiences into their courses, and
- (d) stimulate national dialogue concerning QL.

We accomplish this task primarily by sponsoring panels and sessions at MathFest and the Joint Meetings, publishing this newsletter, maintaining an electronic mailing list, and cooperating with other organizations with similar aims.

Browsing the list of QL activities on our website, you’ll see that we’ve recently sponsored programs that examine quantitative literacy in a wide variety of contexts, including decision making, high school

mathematics education, the environment, civic engagement, and (coming to JMM 2014!) assessment. The possibilities of such connections are literally as wide as the world around us. A few that come to my mind are the following:

- What is the current status of QL in US higher education? Specifically, how widespread are university policies that require students to demonstrate quantitative literacy, as opposed to policies that might simply accept completion of a traditional math class? If QL policies are uncommon, should we encourage wider adoption, and how might we accomplish this?
- What about the international perspective on QL education? Is it seen as important in other countries, and how is it promoted? We know that US students often compare unfavorably to international peers in mathematics tests. Can the same be said of quantitative literacy?
- Many states are actively engaged in implementing the new Common Core State Standards Mathematics (CCSSM). How does QL fit into these new standards, and how can it be part of new initiatives related to CCSSM?
- Members of the MAA are often pioneers in using effective teaching techniques beyond traditional lectures, such as classroom voting, writing projects, inquiry based learning, project based learning, podcasts, class wikis, and technology (calculators, computer algebra systems, spreadsheets, etc.). Do any of these techniques hold special promise for quantitative literacy

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education? What are some good examples of their use for QL education?

- Quantitative literacy courses are frequently taught to general education audiences and so often our majors will miss them, and it is unlikely that our majors will develop these skills through happenstance. Should we infuse QL skills into advanced mathematics curriculum, in courses such as calculus, differential equations, linear algebra, or maybe even abstract algebra? If so, how?
- In my own teaching, I encourage my students to use QL skills to make a decision about a complicated issue and defend that issue. What QL skills are relevant to argumentation of this sort? Are there any particular qualities of an effective quantitative argument aside from the qualities of generally effective arguments? How can we equip our students to produce effective quantitative arguments and to critique them, for example in public policy debates?

In addition to brainstorming connections to explore, as above, the SIGMAA-QL Executive Committee has discussed ways our SIGMAA might promote QL education and activities:

- Some of our fellow SIGMAAs, such as RUME, give awards for the best paper at a session or conference. Would similar recognition be valuable in promoting QL?
- Some Sections of the MAA have a designated "Section Lecturer" who makes him- or herself available to speak throughout the Section during his or her tenure. Might we benefit from designating SIGMAA-QL lecturer(s) each year?
- Speaking of Sections, we learned at the SIGMAA officers' meeting at JMM 2013 that many

Sections are eager to cooperate with SIGMAAs for Section events (such as their annual meetings). Would we be interested in sponsoring sessions or short courses at Section meetings, or designing QL-related activities for Sections to run at meetings?

- There are also many opportunities for collaboration within the MAA and beyond. Within the MAA we have CUPM and CRAFTY, of course, but also other SIGMAAs such as Statistics Education, Teaching of Advanced High School Mathematics, and History of Math that share common goals and interests. Beyond the MAA, there are groups such as Project Kaleidoscope, SENCER, and the National Numeracy Network. What are new ways we can reach out to these organizations and work together to promote our shared missions?
- Finally, our charter calls for us to reach out to other disciplines. In the past, we have done so by promoting mathematics across the curriculum efforts and giving workshops at other disciplinary conferences (such as for sociology). How can we continue these efforts?

I have more questions than I have answers, but that's because the hard work to respond to these opportunities will depend on the participation of our members. Do any of these questions speak to you? Do you have ideas for meeting these challenges? Send an email one of your officers, or to the mailing list. Come to our business meeting in Baltimore in January 2014 (and then stick around for our reception and lecture by Victor Donnay). Let's see what we can accomplish in the next 10 years of SIGMAA-QL!

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Supporting Quantitative Literacy with Projects

by Victor I. Piercey

Quantitative literacy courses are natural domains for projects. Projects allow students to work with real

data instead of contrived examples. As a result, a sense of authenticity enhances the inherent relevance of the contexts. Projects also support long-term time management and teamwork skills which are in high demand. Finally, and perhaps most significantly for

us, appropriately designed projects allow students to construct their own questions. This leads to greater buy-in of, ownership of, and engagement with the mathematics.

I attempted to use projects in a quantitative literacy course in the Spring Semester of 2013 at Ferris State University. To be clear, Ferris State did not have a quantitative literacy course. I obtained an internal grant from the university to construct the course.

My initial idea was to replace the final exam with a final project that students would work on throughout the term, worth 30% of the final grade. Students worked in small groups and were required to submit a term paper and deliver a formal presentation during our scheduled final exam time. Most of the grade on their project came from the paper and presentation, but some portion was allocated to teamwork assessment, and another small portion was awarded for meeting deadlines with intermediate assignments that built towards completion of the project. In addition, I gave awards for "best presentation" and "best paper" at the end.

There were several intermediate assignments that students had to complete as they worked through the project. The first assignment required students to select a broad topic (from a prepared list) and write down at least three questions. This was crucial in creating a role for the students' own voices. Other intermediate assignments included an "initial report" summarizing findings from research along with a preliminary thesis, an outline, and a rough draft. The rough drafts were peer-reviewed before being submitted to me for assessment. Along the way, in the early phases I required group meetings with me. Later, I made myself available for these meetings but left them as optional. Many groups continued to take advantage of these meetings.

The topics that students were asked to choose from included gas prices, climate change, gerrymandering, the fiscal cliff, the debt ceiling, and health care costs. In addition, students were invited to suggest their own topics, subject to my approval. One of the most impressive projects addressed gerrymandering. The students who worked on this project identified several formulas to measure gerrymandering. Using the simplest formula, they measured this index for the congressional district containing Detroit, MI both before and after the most recent redistricting. They found that the index increased by 250%!

Through the semester, I noticed that students were highly engaged with the project. However, outside of the project, student engagement waned con-

siderably. Results from the first exam were quite disappointing, so I decided to try something different. I incorporated a project for the future exam. This improved engagement and performance considerably.

As an example, the second exam project involved analyzing data sets regarding race in the United States today. Students, in their small groups, analyzed data sets about racial aspects of some specific issue (such as employment, housing, or the drug war). Students were asked to answer a list of specific questions related to the content of the course, then use those responses to write an essay responding to a broad, overall question. At the end, they delivered a formal presentation of their findings to the class. Some groups answered related questions that I didn't even ask! This mini-project also involved a class trip to Ferris State University's Jim Crow Museum. The museum visit acted to humanize the data that the students were using.

Since projects were so engaging, I am redesigning an entirely project-based course, with three projects. The final project will now involve service-learning and field data collection and analysis. The formal paper and presentation are broadened to allow for other forms of written and oral products (such as a web page or a video). However, the students will have to deliver a formal written and oral proposal about one-third of the way through the course.

In addition to the final project, there will be two mini-projects on each of two content areas. The first will be the race project used previously. This will address data analysis and statistical significance. Since students will have more time than before, they will be expected to ask their own questions. We will have a class period devoted to posing questions when faced with data. The second mini-project will support financial literacy. This mini-project will be based on a market simulation game developed by David Clark (currently a post-doc at the University of Minnesota). Throughout the course, I plan to measure the impact on math anxiety and non-availing beliefs about mathematics.

Projects involve a number of benefits to student learning and fit well with a quantitative literacy course. I like to characterize quantitative problem-solving as a four stage recurring process:

- Ask a question
- Frame the question and select necessary calculations
- Perform the calculations
- Interpret the results and return to stage 1

Traditional math courses address mostly the third stage, which is the least interesting! Quantitative literacy courses, especially if enhanced or based on projects, get at the full cycle. As a result, there is a great amount of room for both relevance and authenticity. In addition, students will have an experience that they will not only remember at the end of the

course but, paraphrasing Michael Starbird, may keep with them for the remainder of their lives.

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Writing a Math Book for the General Public

by Jeffery Bennett

Have you ever thought about writing a math-related book for the general public? It's a great idea, especially if your book will focus on topics related to quantitative literacy, in which very few books have ever been published. But having had the experience myself, I thought I'd offer a few notes about the process and what you might expect if you are serious about going through with it.

Lingo: A first thing to know is that your book for the general public is what the publishing industry calls a "trade" book. Basically, all books intended for public sale are considered "trade," whether fiction or nonfiction. The other major category is textbooks, which are aimed at very specific audiences.

Proposal: Once you decide you want to write a book, you should immediately start work on your book proposal. This will help you focus your efforts, because it will make sure you are planning a coherent product that will have a chance of finding a publisher. You may later have to modify your proposal to fit differing requirements for different prospective publishers, but in general all proposals should include the following elements:

- **Overview:** a one page (or less) synopsis of your proposed book, which will give prospective publishers a quick understanding of what you intend to write and why you think it is important enough to be worth writing about.
- **Audience:** clearly state the audience you are aiming at. E.g., age level, level of mathematical

sophistication, the type of interests you expect readers to have, etc.

- **Comparable titles:** a short discussion of published books that cover similar ground, explaining why you think your book is different enough to warrant publication.
- **Author credentials:** why you are qualified to write the book.
- **Table of Contents:** a brief, annotated outline of your proposed table of contents.

When to Submit: You do not need to have a complete book to submit to a publisher; in fact, having a complete manuscript can in some cases work against you if the publisher feels that it limits their opportunity to help shape your work. However, you should have at least one sample chapter available for review. So submit your work when you have the proposal and a sample chapter completed.

Who to Submit To: Now it starts to get hard. The consolidation that has occurred in the publishing industry means there are far fewer opportunities for publication today than there were in the recent past. For practical purposes, you probably have two options:

1. If you think you have a potential bestseller on your hands, then you need a major trade publisher (Penguin, Norton, etc.). However, they generally will not even look at a book proposal unless it comes into them through a relatively well-known literary agent. In essence, the agents are now the gatekeepers, which means it is very hard to find one. If you want to go this route, look for an agent by asking colleagues

who might already have one, by finding the agent names for books of similar nature (often thanked in the acknowledgments), or through a web resource such as www.agentquery.com. Cost of an agent: An agent will generally take 15% of all your advances and royalties — but it is worth it, because they'll likely get you a much better contract than you could on your own. Note of realism: Be prepared for rejection — including have your e-mails and phone calls going completely unanswered — but don't be deterred, because you still have option 2.

2. Because you are a professor, you also have the option of going directly to one of the many academic presses. Start by picking potential presses (there's a good list at en.wikipedia.org/wiki/List_of_university_presses), then go to the press website and read about their submission process. Note of realism: It's not easy to get a publisher this way either, and the vast majority of submitted proposals never see the light of day. But you'll never know if you don't try.

If you are fortunate enough to be offered a contract:

If you don't have an agent, then be sure you have your contract looked over by either a lawyer or someone familiar with publishing contracts; one simple option is to join a group like The Author's Guild (authorsguild.org) or the Text and Academic Authors Association (TAAonline.net), both of which offer low-cost contract review services. My personal #1 requirement: While advances and royalties are important, I don't expect my books to make me rich, so my most important contract requirement is that I'm not responsible for any out-of-pocket costs; e.g., don't let the publisher include language that makes you responsible for the costs of illustrations, permissions, indexing, or etc.

Post-Contract: If you've made it this far, then it's

time to finish writing your book. You'll receive input (and deadlines!) from your editor, and once you have a complete draft it will go to reviewers, whose comments must be taken very seriously. If all goes well, you'll get through manuscript approval, and then your book will be copy edited, set into pages, and published.

Generating Sales: The publisher will give the book an initial push for sales, but unless the sales take off like a rocket, you'll be shocked at how quickly your book seems to be forgotten by your publisher. If you want to keep pushing it, you'll likely have to do that on your own.

The Rewards: So is it worth it? Realistically, you won't get rich from your book. Let's say you have a high-end trade book royalty of 15% on a \$25 book, which is \$3.75 per copy. I'm no expert in sales, but my sense is that most nonfiction trade books sell fewer than 1,000 copies, and you are considered an enormous success if you sell more than 5,000. In other words, you'll be likely to earn less than about \$5,000, and very fortunate to earn above \$20,000. This can be a nice bonus on top of your academic salary, but you certainly can't live off it. The real rewards have to be in feeling like you've contributed to the conversation that books can engender.

Please feel free to e-mail me if you have further questions, though I can't guarantee that I'll have any answers ...

Jeffrey Bennett's trade book Math for Life (math-for-life.com), which sold about 850 copies in its original edition, released in an "Updated Edition" on Nov. 1. Jeff is also available to speak on the topic of "Math for Life" at math or education conferences, and will often pay his own way for an audience that might be interested in his books.

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Reviews

Go-To Graphs: Internet sources for QL-conductive graphics

Advocates for quantitative literacy are always searching for good sources for timely uses of data to

understand the news, and often the best sources are built around a graph. Here are a few authors your reviewer looks to for thoughtful analysis and thought-provoking graphics.

Nate Silver Mr. Silver's FiveThirtyEight blog established a reputation for unusual accuracy in predicting the outcome of Presidential and Senatorial elections using polling data from a wide variety of sources. He created his own blog in 2008 to cover the election of that year, and it was so successful that in 2010 it was licensed by *The New York Times* to be part of their collection of blogs. There he produced a strikingly accurate prediction of the outcome of the Presidential election that was accurate in all 50 states. This summer it was revealed that the FiveThirtyEight brand was purchased by ESPN. As the 2014 election develops look for interesting maps and thoughtful discussions of the utility and limitations of public opinion polling, and the foibles of the many different firms that do the polling at "FiveThirtyEight.com." The prominence of graphical information here is less than in some later entries, but Silver's graphs tend to be worth studying.

Carl Bialik *The Wall Street Journal's* "The Numbers Guy" blog and weekly column has been critically analyzing the use and abuse of statistics since 2005; it has become the archetype of this category. While graphical displays were not a necessity in this case, they were frequently available and the analysis he offers was typically worthy of perusal. Further, perhaps because of the venue, Bialik could be counted on to provide a more conservative outlook on issues than many of the others on this list, a counterweight to your reviewer's own political disposition and thus a particularly valuable resource. Consider for example his levelheaded discussion of the difficulties associated with using rape statistics to assess the actual prevalence of rape, or his thoughtful presentation of the evidence supporting the assertion that national politics in the US has tended to become more polarized. It is a big surprise to hear that Mr. Bialik has decided to leave the *Journal* and join Mr. Silver's new enterprise. Yet another reason to frequent the new web site.

Derek Thompson The economics editor for *The Atlantic* magazine and its companion web site has a track record for digesting economics studies and making them understandable to the public. A recent effort has been videos in a series called "Economics in Plain English." These are each less than 5 minutes long and deal with questions that are appropriate topics for dis-

cussion in a QL context. Beyond this, on his blog page one can find a plethora of interesting and thoughtful entries, generally built around a graph or two that are especially worthy of attention. As an example, consider the series of reports on the associations between race, classes of jobs, and poverty level wages. These are quantitatively rich, novel, and thought-provoking.

Jordan Weissmann It seems unfair to mention Thompson without also including his colleague. Weissmann is a senior associate editor at *The Atlantic*, and his blog page is also a treasure trove of interesting takes on important current news with a quantitative bent. I watch my inbox for announces of blog posts (or magazine articles, though they are much less frequent) whose title includes "in n graphs." These tend to be short pieces that offer insightful treatment of graphics from a variety of generally reputable sources. For example, this brief rebuttal of the myth of the welfare queen, or this analysis of a potential downside of raising minimum wage.

Paul Krugman The Nobel Prize-winning economist is one of the most thoughtful and prolific bloggers on economic news and trends, posting at his aptly named "Conscience of a Liberal" blog, hosted by *The New York Times*. In addition to frequent inclusion of interesting graphics from economic papers under discussion, Krugman often makes use of the Federal Reserve Bank of St. Louis' economic database and online graphing utility, FRED (as in this post, for instance). Krugman's ability to drop compelling charts into what have to be hastily prepared blog posts has inspired your reviewer to become proficient in creating plots on FRED, and readers can, too, having questions amenable to FRED's kind of answers.

Hans Rosling The professor of international health has gained an international following largely through his TED talks, and his web site, gapminder.org, is a must see destination for anyone interested in quantitative understanding of global issues of human development. Just for instance, almost anyone this deep into this article would almost certainly enjoy Rosling's The Joy of Stats video, that was originally broadcast on the BBC in 2010. But the real draw for a QL aficionado is the Gapminder World

online graphing application that assembles an enormous variety of human development data, from a wide selection of agencies, covering economic, social, educational, health, energy, environmental, infrastructure, and many more measures for countries all over the world. If one would like to see Gini index plotted against primary school completion rate with points whose sizes vary with per capita carbon dioxide emission and whose colors indicate the main religion, one can create just such a plot, and animate it to see variation over time. The number of possibilities is dizzying.

Ezra Klein The quintessential Washington pundit is not a perennial on my list of great sources for graphics, but his page collecting “The Best Graphs of 2013” is reason enough to make this list. You can see string theorist Brian Green’s choice, a graph summarizing experimental evidence supporting the existence of the Higgs boson (I wish he would explain a little more completely), or commentator Ta-Nehisi Coates’ favorite, a visualization of an association between concentrated poverty and race in the US. In between are predictable graphs (Patty Murray is worried about the federal budget, Bill

McKibben about global warming) and surprising ones (Jonathan Franzen shows that cats are killing an enormous number of birds, and that gun companies hope this will distract you from the damage being done to raptor populations by lead ammunition). Well worth a visit.

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Selected links from this article:

<http://fivethirtyeight.blogs.nytimes.com/>
<http://www.fivethirtyeight.com>
<http://blogs.wsj.com/numbersguy/>
<http://www.theatlantic.com/special-report/economics-simplified>
<http://www.theatlantic.com/derek-thompson/>
<http://www.theatlantic.com/jordan-weissmann/>
<http://krugman.blogs.nytimes.com/>
<http://research.stlouisfed.org/fred2/>
http://www.ted.com/speakers/hans_rosling.html
<http://www.gapminder.org>
<http://www.washingtonpost.com/blogs/wonkblog/wp/tag/graphs-2013/>

Recent and Upcoming Events

Recent

MathFest 2013

Hartford, CT, July 31–August 3, 2013
Connecticut Convention Center

Statistics Isn’t Mathematics: So How’s That Working Out?

James R. Leitzel Lecture

Saturday, August 3, 8:30–9:20 AM

This invited lecture was given by Ann Watkins of California State University, Northridge.

Bridging A Gap between Creative Literacy and Quantitative Literacy: Using Poetry to Improve Quantitative Reasoning

David Blackwell Lecture

Friday, August 2, 1:00–1:50 PM

This invited lecture was given by Karen Morgan Ivy of New Jersey City University.

National Numeracy Network 2013 Annual Meeting

In conjunction with Project Kaleidoscope and the AAC&U

Transforming STEM Education: Inquiry, Innovation, Inclusion, and Evidence

October 31–November 2, 2013, San Diego, CA

An index of presentations, with PDFs for many of them, is available at <http://www.aacu.org/meetings/stem/13/resources.cfm>

Upcoming

Joint Mathematics Meetings

Baltimore, MD, January 15–18, 2013
Baltimore Convention Center

MAA Session on Assessing Quantitative Reasoning and Literacy - See more at:
Wednesday, January 15 8–10:55 AM
Room 337 BCC

Organized by Semra Kilic-Bahi, Eric Gaze, Andy Miller, Aaron Montgomery and with presentations by Betty Mayfield, Maura Mast, Robert J Krueger, Cinnamon Hillyard, Semra Kilic-Bahi, Stuart Boersma, Eric Gaze, Victor Piercey and Rodney McNair. Link to full description.

MAA Session: Instructional Approaches to Increase Awareness of Societal Value of Mathematics
Friday, January 17 1–3:35 PM
Room 341 BCC

Organized by Jessica Deshler and Elizabeth Burroughs, and with many presenters, including Livie Carducci, Victor Piercey, and Andy Miller. Link to full description.

SIGMAA on Quantitative Literacy Reception, Business Meeting, and Guest Lecture - See more at:
Thursday January 16, 6–7:50 PM
Room 338 BCC

After the business meeting, Victor Donnay of Bryn Mawr College will give a guest lecture on “Sustainability + Serendipity = Math Awareness Month 2013.” Our annual business meeting is usually followed by an informal reception at a local watering hole. Link to full description.

MAA Poster Session Supported by NSF-DUE
Wednesday, January 15 2:15–4:15 PM
Exhibit Hall G, 100 Level, BCC

This session includes posters: “Using Research to Shape Instruction and Placement in Algebra and Precalculus” by Bernie Madison, “Characteristics of Successful Programs in College Calculus” by David Bressoud, “Quantitative Literacy and Reasoning Assessment” by Eric Gaze, “Quantitative and Mathematics Support Centers Workshop to Develop Handbook of Best Practices” by Michael Schuckers, “Quantitative Reasoning for Business: an Inquiry-Based Approach” by Victor Piercey, “Mathematics and Social Advocacy” by Sandra Kingan, “Undergraduate Sustainability Experiences in Mathematics” by Ben Galluzzo among many others.

MAA Minicourse #1
Wednesday, January 15 9–11 AM & Friday, January 17 9–11 AM
Room 342 BCC

Gizem Karaali and Eric Marland will present a mini course on Humanistic Mathematics.

MAA Minicourse #12
Wednesday, January 15 9–11 AM & Friday, January 17 9–11 AM
Room 344 BCC

David Housman will present a mini course based on his book (co-authored with Rick Gilman, *Models of Conflict and Cooperation*. He describes it as “A game theory path to quantitative literacy.”

MathFest 2014

Portland OR, August 7–9 2014

The SIGMAA’s contribution to the schedule will be determined at the business meeting in Baltimore listed above.

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